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STATUS OF MOUNTAIN PINE BEETLE, GALLATIN DISTRICT, GALLATIN NATIONAL FOREST, 1973

by

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INTRODUCTION

An epidemic infestation of the mountain pine beetle, *Dendroctonus ponderosae* Hopk., was detected by aerial observers during August 1970 on the Gallatin Ranger District, Gallatin National Forest (fig. 1). At that time, about 3,800 trees were infested on approximately 2,000 acres of mixed ownership which included Burlington Northern Railway, State of Montana, private, and National Forest.

A survey by Gallatin National Forest personnel in 1971 showed the number of infested trees had doubled in 1 year's time.[1/] This prompted a meeting of resource managers of the intermingled ownerships within the outbreak area and included Big Sky, Inc., Burlington Northern, Montana Division of Forestry, and U.S. Forest Service. At that meeting, control strategy was discussed for drainages with major infestation. Alternatives for suppression were (1) direct control with ethylene dibromide, (2) fell and burn infested trees, (3) salvage logging, and (4) do nothing. Direct control by felling and burning of infested trees was initiated on National Forest land during spring 1971. Felling and burning was done in Hellroaring and Logger Creek drainages. Removal of infested trees by logging was done in the Swan Creek campground.

Examination of treatment areas in October 1971 (McGregor and Dewey 1971) showed direct control apparently did little to reduce the potential for increase in either Hellroaring or Logger Creek drainages.

1/ 5240 letter dated April 21, 1971, from Maynard T. Rost, Timber Staffman, Gallatin NF, to the Gallatin Forest Supervisor.

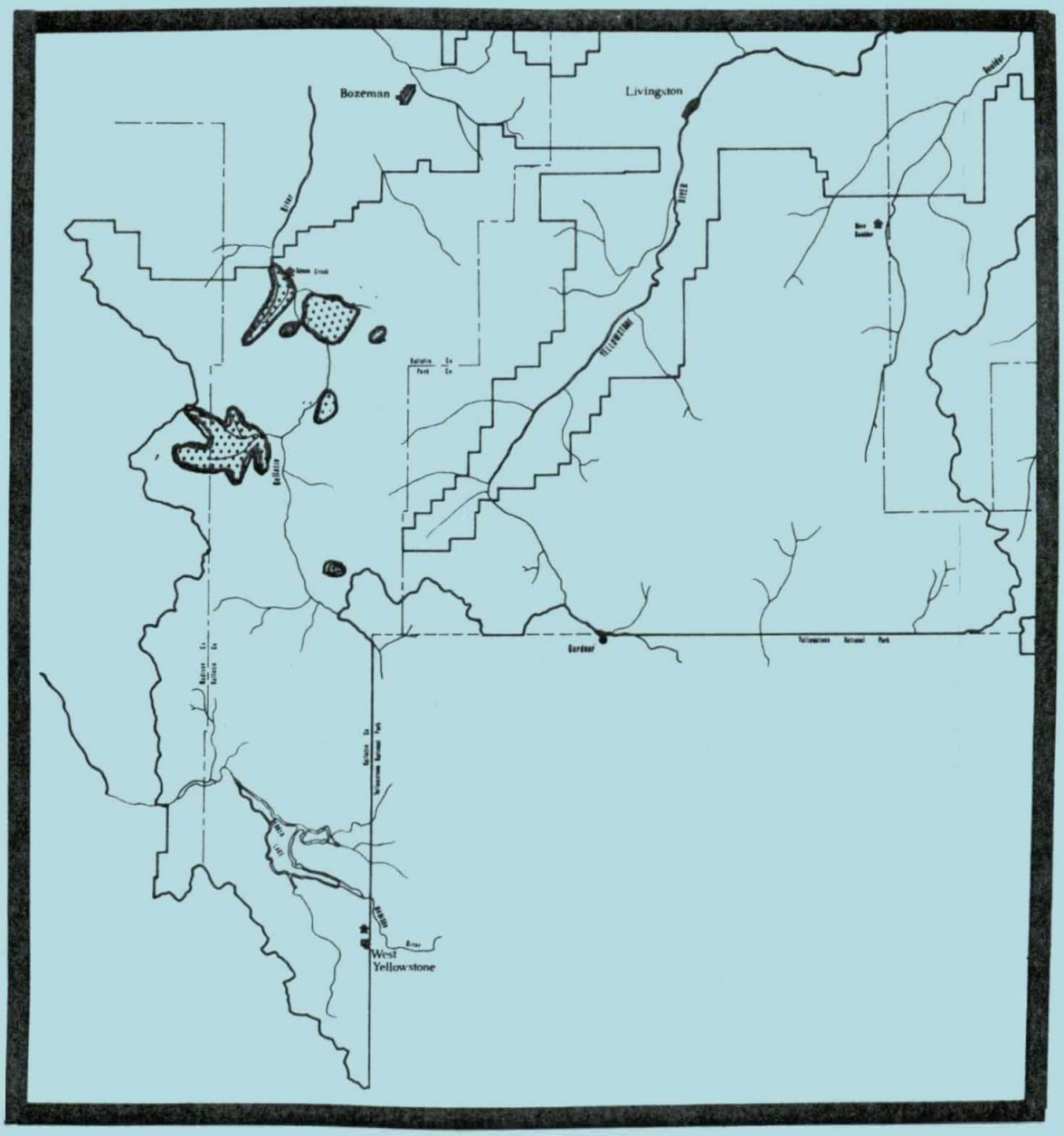

Figure 1.--Mountain pine beetle infestation, Gallatin Ranger District, Gallatin National Forest, 1973.

New attacked trees were prevalent throughout both drainages. The only direct control attempted in 1972 was felling and burning of infested trees around summer home areas and in Swan Creek campground.

A survey was initiated during January-February 1973 to update infestation boundaries, obtain estimates of the number of lodgepole pine killed, and determine volume loss from 1970-72.

METHODS

A variable plot cruise (BA = 10) was conducted in four areas. Plots were located at 5-chain intervals on lines 5 chains apart. A Spiegel-Relaskop was used to determine trees to be tallied in each plot. Each tree 5 inches d.b.h. and larger occurring in the variable plot was recorded by species, measured for diameter at breast height and total height. Then trees were classified into one of the following five classes:

0 - Green, uninfested.
1 - Attacked in 1972; green foliage, brood in cambium.
2 - Attacked in 1971; red foliage, brood emerged.
3 - Snags; attacked in 1970 or prior, majority of needles dropped.
4 - Pitchout; green foliage, pitchtubes, no brood.

A 100 percent cruise was conducted in six other infested areas. A total of 558 acres were surveyed. Data were analyzed by a modified sale cruise program.

RESULTS

The coniferous stand surveyed is composed of 68.3 percent lodgepole pine, 17.8 percent Douglas-fir, 12.5 percent Engelmann spruce, and 1.2 percent subalpine fir. Habitat type of the areas sampled is *Abies lasiocarpa/Vaccinium scoparium*; that of areas 100 percent cruised is *Pseudotsugae menziesii/Symphoricarpos albus*. Elevation within the infested area ranges from 5,350 to about 7,000 feet. A breakdown of residual green stems is shown in table 1.

Table 1.--Green stems/acre before and during mountain pine beetle outbreak, Gallatin Ranger District, Gallatin National Forest, 1973

Year	Diameter class 6	8	10	12	14	16	18+	Total
1970	35.6	65.9	100.0	72.5	49.6	25.9	45.5	395.0
1971	34.9	63.9	92.2	56.8	34.7	19.3	36.2	338.0
1972	32.7	56.8	80.6	47.6	26.5	14.1	29.7	288.0

Tree mortality and volume loss data are shown in tables 2 and 3. The estimated number of trees killed during 1970-72 was 10,845, with an estimated volume loss of 797,802 board feet of merchantable timber. Approximately 4 percent of the lodgepole pine stand was killed in 1970, 5 percent in 1971, and 7 percent in 1972. Average d.b.h. of infested trees was 10.7 inches in 1970 and increased to 12.5 inches in 1971-72. Residual green lodgepole pine averaged 8 inches d.b.h. A breakdown of dead stems/acre by d.b.h. size class is shown in table 4.

Table 2.--Estimated tree mortality, Gallatin Ranger District, Gallatin National Forest, 1970-72

Unit surveyed	Acres infested	Infested trees/acre						Number lodgepole pine killed			
		1970	Mean d.b.h.	1971	Mean d.b.h.	1972	Mean d.b.h.	1970	1971	1972	Total
Upper Portal Creek	35	0.3	15.0	1.2	13.0	1.4	13.0	10	43	48	101
Cascade Creek	20	2.0	9.0	1.0	13.0	2.6	13.0	51	19	52	122
Squaw Creek	45	.9	14.0	1.1	14.0	.3	13.0	40	51	14	105
Swan Creek Campground	25					.6	9.0			15	15
Tamphery	40	.9	8.0	.9	10.0	1.1	11.0	38	36	45	119
Greek Creek	30			8.3	13.0	1.5	10.0		249	46	295
Indian Ridge	58	20.8	10.0	1.2	12.0	23.4	11.0	1,204	70	1,354	2,627
Hellroaring Creek	260	5.3	9.0	6.4	11.0	10.8	10.0	1,374	1,663	2,797	5,834
Logger Creek	45	6.9	10.0	11.8	11.0	6.4	10.0	310	1,026	290	1,626
Total or average		5.3	10.7	3.9	12.5	6.0	12.5	3,027	3,157	4,661	10,844
S.E. percent		19.6		22.0		18.9					

Table 3.--Estimated lodgepole pine volume loss due to mountain pine beetle, Gallatin Ranger District, Gallatin National Forest, 1970-72

Unit surveyed	Acres infested	Volume loss/acre (board feet)			Total volume loss (board feet)		
		1970	1971	1972	1970	1971	1972
Upper Portal Cr.	35	54.0	174.0	189.0	1,888	6,102	6,604
Cascade Cr.	20	164.0	139.0	408.0	3,289	2,784	8,168
Squaw Cr.	45	148.0	193.0	43.0	6,664	8,704	1,949
Swan Creek Campground	25			26.0			646
Tamphery	40	42.0	66.0	92.0	1,665	2,659	3,698
Greek Cr.	30		1,011.0	95.0		30,319	2,855
Indian Ridge	58	1,251.0	118.0	1,837.0	72,549	6,860	106,532
Hellroaring Cr.	260	302.0	545.0	816.0	78,573	141,719	212,087
Logger Cr.	45	564.0	531.0	441.0	25,390	46,178	19,857
Total or average		360.7	347.1	438.5	190,018	245,325	362,396

Table 4.--Dead stems/acre, Gallatin Ranger District Gallatin National Forest, 1970-72

Year	Diameter class							Total
	6	8	10	12	14	16	18	
1970	0.1	0.4	1.4	1.4	1.3	0.6	0.5	5.7
1971	--	.1	1.0	1.5	1.4	.6	.9	5.5
1972	.2	7.1	1.1	9.1	8.2	5.1	.6	31.4
Total	.3	7.6	3.5	12.0	10.9	6.3	2.0	42.6

DISCUSSION

Lodgepole pine comprises nearly 70 percent of the stand within the areas surveyed. Amman and Baker (1972) found that survival of lodgepole pine to attack by mountain pine beetle was only 37 percent in the lower elevational zones (5,000 to 7,000 feet). This was because a generation of beetles could be produced in 1 year, while at elevational zones of 8,900 feet or higher, more than 1 year was required to complete a generation and survival of lodgepole pine to attack by the mountain pine beetle was higher. A similar relationship holds for basal area which ranged from 32 percent in elevational zones of 5,000 to 7,000 feet and 71 percent in elevational zones averaging 8,900 feet (Amman and Baker 1972). Roe and Amman (1970) stated that stands above the 8,000 foot elevation zone could be relatively safe from mountain pine beetle; also, the risk of losing lodgepole pine to the beetle was lowest in the *Abies lasiocarpa/Vaccinium scoparium* associations (high elevations), and intermediate in the *Pseudotsuga menziesii/Calamagrostis rubescens* (low elevations). These survey data show our heaviest infestation to be in the *Abies lasiocarpa/Vaccinium scoparium* habitat type.

The number of trees killed by the mountain pine beetle has increased steadily since 1970. Ratio of new to old attacks was 1:1 from 1970-71, and 1.4:1 from 1971-72. Approximately 73 percent of the mortality occurred in trees 12 inches d.b.h. and larger. It has been shown that mountain pine beetle strongly favors trees of larger diameters each year, as well as over the life of the infestation (Gibson 1943; Hopping and Beall 1948; Cole and Amman 1969), and that trees 12 inches d.b.h. and larger produce more beetles than they absorb (Cole and Amman 1969). This probably accounts for the increase in number of trees attacked from 1970-72.

Greatest tree mortality occurred in Hellroaring, Indian Ridge, and Logger Creek areas respectively. A decrease in the number of infested trees occurred in Logger Creek from 1971 to 1972, but the number of trees killed increased significantly in Hellroaring and Indian Ridge areas.

Additional heavy infestation exists on State and private ownership directly north of Logger Creek drainage. Size of area infested and number of trees killed is expected to increase on private ownership in 1973.

All indications point toward an increasing trend during 1973. Number of infested trees will probably increase, and new infestation can be expected in uninfested stands.

Salvage logging for removal of infested trees would do much to slow the impetus of the outbreak. A decrease in the number of trees killed is not expected as long as stands contain significant numbers of lodgepole pine above the 10-inch d.b.h. size class; and as long as stands are overstocked which results in competition between trees and reduces growth, thus reducing tree vigor and resistance to beetle attack.

REFERENCES CITED

Amman, Gene D., and B. H. Baker, 1972. Mountain pine beetle influence on lodgepole pine stand structure. Jour. Forestry 70(4).

Cole, W. E., and Gene D. Amman, 1969. Mountain pine beetle infestations in relation to lodgepole pine diameters. USDA Forest Serv., Intermountain Forest & Range Exp. Sta., Ogden, Utah, research note INT-95, 7 pp.

Gibson, A. L., 1943. Status and effect of a mountain pine beetle infestation on lodgepole pine stands. Forest Insect Lab., USDA Forest Service, Coeur d'Alene, Idaho, 34 pp.

Hopping, G. R., and G. Beall, 1948. The relation of diameter of lodgepole pine to incidence of attack by the bark beetle, *Dendroctonus monticolae* Hopk. Forest Chron. 24: 141-145.

McGregor, M. D., and J. E. Dewey, 1971. Evaluation of mountain pine beetle infestations on the Gallatin Ranger District, Gallatin NF, Montana. USDA Forest Serv., Division of State and Priv. Forestry, Missoula, Montana, report 71-14.

Roe, A. L., and G. D. Amman, 1970. The mountain pine beetle in lodgepole pine forests. USDA Forest Serv., Intermountain Forest & Range Exp. Sta., Ogden, Utah, research paper INT-71, 23 pp.